USER'S MANUAL

DIGITAL MULTIMETER

DMR-4200

CIRCUIT-TEST ELECTRONICS
www.circuittest.com

TABLE OF CONTENTS

SAFETY

Safety Information 2
Safety Symbols 3

INTRODUCTION

LCD Symbol Definitions 3
Front Panel Description 4

SPECIFICATIONS

General 5
Ranges and Accuracy 6

OPERATING INSTRUCTIONS

1. DC Voltage Measurement 7
2. AC Voltage Measurement 8
3. DC Current Measurement 8-10
   a) less than 200mA DC current
   b) 200mA or more DC current
4. AC Current Measurement 10-11
   a) less than 200mA DC current
   b) 200mA or more AC current
5. Resistance Measurement 11-12
6. Continuity Test 12
7. Diode Test 13
8. Frequency Measurement 14
9. Temperature Measurement 14
10. Capacitance Measurement 15
11. Hold Function 15
12. Battery Replacement 16
13. Fuse Replacement 16-17

MAINTENANCE 18

ACCESSORIES 18

WARRANTY 18

SAFETY INFORMATION

This meter is CUL and UL approved and conforms to IEC 61010-1 for Category II 1000V. This meter is designed to be safe under the following conditions: indoor use, altitude up to 2000m, temperature 5°C to 40°C, maximum relative humidity 80% for temperatures up to 31°C decreasing linearly to 50% relative humidity at 40°C and rated pollution degree 2. Caution and proper guidelines must be followed for personal and product safety. Read this instruction manual carefully and completely before using the meter. Lack of caution or poor safety practices can result in serious injury or death.

- This meter is not recommended for high voltage industrial use; for example, do not use for measurement on 440VAC or 600VAC industrial power mains. The unit is intended for use with low energy circuits up to 600VDC / 600VAC or high energy circuits up to 250VAC / 250VDC only.
- Use caution when working above 60VDC or 30VAC RMS as these voltages pose a shock hazard.
- Always consider circuits to be energized. Never assume any equipment to be de-energized.
- Always start with power off. Set the function switch to the correct setting before making any measurements and do not change position of the function switch during measurements.
- Never connect unit to AC or DC powered circuits when the function switch is set to resistance, diode check or continuity ranges.
- Always disconnect the power when performing resistance, diode or capacitance tests. Discharge capacitor before testing.
- Disconnect the live/positive test lead (red) prior to disconnecting the common/negative test lead (black).
- When appears on the display, change the battery immediately.
- Disconnect test leads from the meter before removing the battery or the fuse.
- Do not operate the unit unless the case is completely closed.
- When using the test probes always keep fingers behind the finger guards. Never touch the exposed probe tip.
- Always inspect the instrument, test leads and other accessories for damage prior to use.
- Use only UL recognized test leads (included with this meter).

SAFETY SYMBOLS

Safety symbols and special annunciators on the meter and in this manual indicate cautions and warnings of important operational procedures that must be followed to ensure personal and product safety.

⚠ This symbol indicates a General Warning. When adjacent to a terminal or operating device indicates that the operator must refer to an explanation in the Operating Instructions.

500V MAX This symbol indicates that the terminal(s) so marked must not be connected to a circuit point at which the voltage with respect to ground exceeds 500V AC/DC.

This symbol adjacent to one or more terminals indicates them as being associated with ranges that may in normal use, be subjected to particularly hazardous voltages. For maximum safety, the meter and its test leads should not be handled when these terminals are energized.

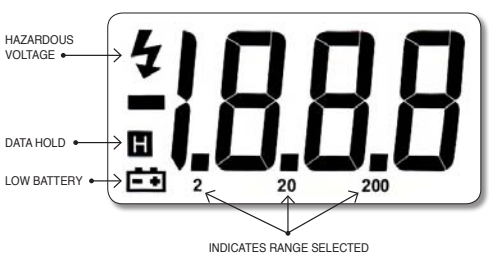
This meter is protected by double insulation. Service this meter by a professional only.

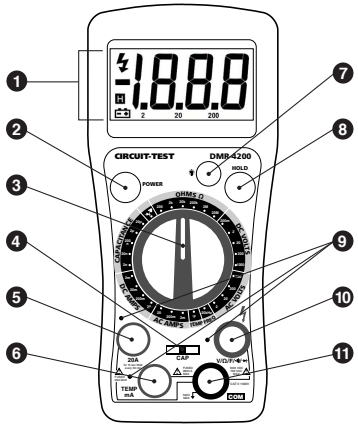
INTRODUCTION

DMR-4200 is a manual ranging digital multimeter with a 2000 count 3-1/2 Digit LCD display. This meter can measure/test the following:

- Voltage
- Resistance
- Diode
- Temperature
- Current
- Continuity
- Capacitance
- Frequency

LCD DISPLAY SYMBOLS





FRONT PANEL DESCRIPTION

NO.	ITEM	DESCRIPTION
1	LCD Display	3-1/2 digit 2000 count LCD Display
2	Power Button	Power ON/OFF push button switch
3	Function Switch	Function Switch to select measurement mode
4	Capacitance Jack	Insert the capacitor's two leads
5	20A Jack	Positive Input Jack to plug in red test lead for 20A measurement only
6	TEMP/mA Jack	Positive Input Jack to plug in red test lead for current measurement up to 200mA or '+' end of temperature adapter.
7	Backlight Button	Backlight display - will shut off automatically after 5 seconds
8	Hold Button	The displayed data will freeze and H will appear on the LCD. Changes in the input signal will not change the display.
9	Test Lead Input Indicating LEDs	Lighted LED indicates the correct jack to plug in the test lead for the selected function. LED will turn off after the test lead is fully inserted. If the test lead is incorrectly plugged in, the LED will start blinking and buzzer will sound.
10	V/Ω/F/•))/⊣◀ Jack	Positive Input Jack to plug in red test lead for voltage, resistor, frequency, continuity and diode check.
11	COM Jack	Plug in black test lead in all measurement modes, common ground

SPECIFICATIONS

GENERAL

Display:	3 $^{1}/_{2}$ digit 2000 count LCD
Maximum Display:	1999
Backlight Display:	5 seconds ON
Ranging:	Manual
Polarity:	Automatic, minus (-) sign indicates negative polarity, no sign for positive polarity
Measuring rate:	3 times/sec
Input impedance:	10MΩ (DCV / ACV)
Diode Test:	Test current of 1.0 mA maximum
Continuity:	Audible signal sounds if resistance is less than 30Ω
Over range indication:	'I' is displayed
Operating Temp:	41 to 95° F (5 to 35° C)
Storage Temp:	14 to 122° F (-10 to 50° C)
Relative Humidity:	<75% Operating/Storage
Power Source:	1 x 9V Battery
Fuse:	0.5A/250V (5x20mm Fast Acting Ceramic), 15A/250V (6.3x32mm Fast Acting Ceramic)
Dimensions:	185(H) x 90(W) x 45(D) mm ($7^{5}/_{16}$ x $3^{1}/_{2}$ x $1^{13}/_{16}$")
Weight:	347g (12.25 oz)
Accessories included:	One pair of test leads, 1 x 9V battery, User's manual

RANGES AND ACCURACY

FUNCTION	RANGE	RESOLUTION	ACCURACY
DC VOLTAGE (DC V)	200mV 2V 20V 200V 1000V	100μV 1mV 10mV 100mV 1V	±(0.5% reading + 1 digit) ±(0.8% reading + 2 digits)
AC VOLTAGE (AC V) (40-400HZ)	2V 20V 200V 700V	1mV 10mV 100mV 1V	±(0.8% reading + 3 digits) ±(1.2% reading + 3 digits)
DC CURRENT (DC A)	2mA 20mA 200mA 20A	1μA 10μA 100μA 10mA	±(0.8% reading + 1 digits) ±(1.2% reading + 1 digit) ±(2.0% reading + 5 digits)
AC CURRENT (AC A) (40-400HZ)	2mA 200mA 20A	1μA 100μA 10mA	±(1.0% reading + 3 digits) ±(1.8% reading + 3 digits) ±(3.0% reading + 7 digits)
RESISTANCE	200 Ω 2k Ω 20k Ω 200k Ω 2M Ω 20M Ω	0.1 Ω 1 Ω 10 Ω 100 Ω 1k Ω 10k Ω	±(0.8% reading + 1 digit) ±(1.0% reading + 2 digits)
CAPACITANCE	2nF 20nF 200nF 2μF 20μF	1pF 10pF 100pF 1nF 10nF	±(2.5% reading + 3 digits)
FREQUENCY	20Hz-20KHz	10Hz	±(0.1% reading + 5 digits)
TEMP °F	0 to 500°F	1°F	±(1.0% reading + 4 digits)

NOTE: Accuracy consists of: (% reading i.e. accuracy of the measurement circuit + digits i.e. accuracy of the analog to digital converter)

OPERATING INSTRUCTIONS

This meter comes with an exclusive patented technology featuring bright LEDs indicating the correct input jack to plug-in the positive (red) test lead for the selected function. The LED turns off after the test lead is completely plugged in the correct jack. If the test lead is plugged in the wrong jack, the LED will start flashing and the buzzer will start beeping.

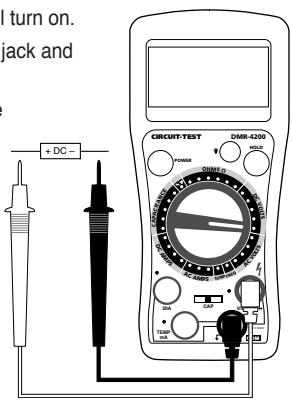
1. DC VOLTAGE MEASUREMENT

⚠ WARNING: MAXIMUM INPUT IS 1000V DC. USE EXTREME CAUTION WHEN WORKING WITH HIGH VOLTAGES. NEVER APPLY THE TEST LEAD TO THE MEASURING CIRCUIT WHEN CHANGING THE POSITION OF THE FUNCTION SWITCH. IF YOU ARE UNSURE OF THE VOLTAGE BEING MEASURED, SELECT THE HIGHEST RANGE AND REDUCE UNTIL A SATISFACTORY READING IS OBTAINED.

➔ Set the function switch to 1000 on the **DC VOLTS** scale.

➔ The LED next to V/Ω/F/•))/⊣ jack will turn on.

➔ Plug the red test lead in V/Ω/F/•))/⊣ jack and the black test lead in **COM** jack.



➔ Apply the test leads to the circuit to be measured. Ensure that the black lead is connected to the negative side of the circuit and red lead to the positive.

➔ Read the displayed voltage.

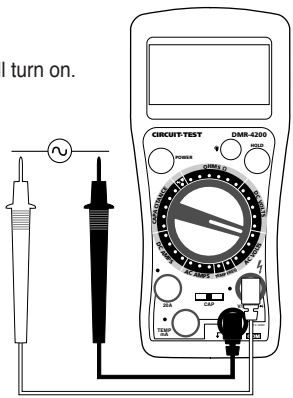
➔ If the reading displayed does not have a sufficient number of digits i.e. 00.2 Instead of 1.786, set the function switch to the next lower range. Repeat until you have maximum digits possible without displaying 'I'.

➔ If the minus (-) sign appears it means the voltage is negative at the point being measured.

➔ If 'I' appears on the display, it indicates over-range. Immediately remove test leads from the measuring circuit to avoid any damage to the meter. The input voltage should not exceed the measurement capability of this meter.

2. AC VOLTAGE MEASUREMENT

⚠ WARNING: MAXIMUM INPUT IS 700V AC. USE EXTREME CAUTION WHEN WORKING WITH HIGH VOLTAGES. NEVER APPLY TEST LEADS TO THE MEASURING CIRCUIT WHEN CHANGING THE POSITION OF THE FUNCTION SWITCH. IF YOU ARE UNSURE OF THE VOLTAGE BEING MEASURED, SELECT THE HIGHEST RANGE AND REDUCE UNTIL A SATISFACTORY READING IS OBTAINED.



➔ Set the function switch to 700 on the **AC VOLTS** scale.

➔ The LED next to V/Ω/F/•))/⊣ jack will turn on.

➔ Plug the red test lead in V/Ω/F/•))/⊣ jack and the black test lead in **COM** jack.

➔ Apply the test leads to the circuit to be measured.

➔ Read the displayed voltage.

➔ If the reading displayed does not have a sufficient number of digits, i.e. 002 instead of 2.1011, set the function switch to the next lower range. Repeat until you have maximum digits possible without displaying 'I'.

➔ If 'I' appears on the display, it indicates over-range. Immediately remove test leads from the measuring circuit to avoid any damage to the meter. The input voltage should not exceed the measurement capability of this meter.

3. DC CURRENT MEASUREMENT

⚠ WARNING: WHEN MEASURING CURRENT REMOVE ALL POWER FROM THE CIRCUIT BEING TESTED. NEVER APPLY THE TEST LEAD TO THE MEASURING CIRCUIT WHEN CHANGING THE POSITION OF THE FUNCTION SWITCH. IF YOU ARE UNSURE OF THE CURRENT BEING MEASURED, SELECT THE HIGHEST RANGE AND REDUCE UNTIL A SATISFACTORY READING IS OBTAINED.

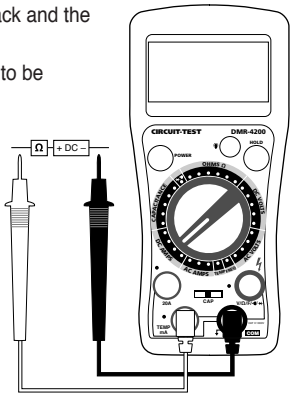
a) Less than 200mA DC Current Measurement

➔ Set the function switch to 200m on the **DC AMPS** scale.

➔ The LED next to TEMP/mA jack will turn on.

➔ Plug the red test lead in TEMP/mA jack and the black test lead in **COM** jack.

➔ Remove power from the circuit that is to be measured. Open up the circuit and connect the black lead to the negative side and the red lead to the positive side of the circuit so that the test leads are in series with the load to be measured.



➔ Apply power to the circuit.

➔ Read the displayed current.

➔ If the numeral value in the display is too small, change the function switch to next lower range. Repeat until you have maximum digits possible without displaying 'I'.

➔ If 'I' appears on the display, it indicates over-range. Immediately remove test leads from the measuring circuit to avoid any damage to the meter.

b) 200mA or more DC Current Measurement

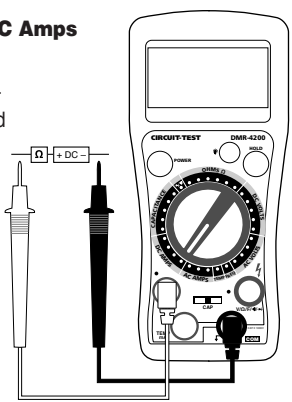
CAUTION! Do not exceed 15 seconds when measuring the 20A range and wait for 30 minutes between each measurement.

➔ Set the function switch to 20 on the **DC Amps** scale.

➔ The LED above 20A jack will turn on.

➔ Plug the red test lead in 20A jack and the black test lead in **COM** jack.

➔ Remove power from the circuit that is to be measured. Open up the circuit and connect the black lead to the negative side and the red lead to the positive side of the circuit so that the test leads are in series with the load to be measured.



➔ Apply power to the circuit.

➔ Read the displayed current.

➔ If 'I' appears on the display, it indicates over-range. Immediately remove test leads from the measuring circuit to avoid any damage to the meter.

4. AC CURRENT MEASUREMENT

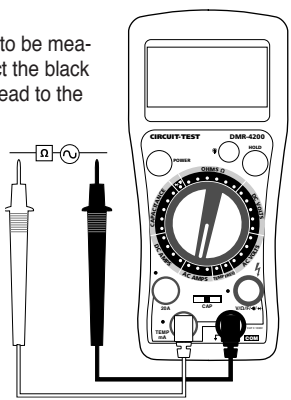
⚠ WARNING: WHEN MEASURING CURRENT REMOVE ALL POWER FROM THE CIRCUIT BEING TESTED. NEVER APPLY THE TEST LEAD TO THE MEASURING CIRCUIT WHEN CHANGING THE POSITION OF THE FUNCTION SWITCH. IF YOU ARE UNSURE OF THE CURRENT BEING MEASURED, SELECT THE HIGHEST RANGE AND REDUCE UNTIL A SATISFACTORY READING IS OBTAINED.

a) Less than 200mA AC Current Measurement

➔ Set the function switch to 200m on the **AC AMPS** scale.

➔ The LED next to TEMP/mA jack will turn on.

➔ Plug the red test lead in TEMP/mA jack and the black test lead in **COM** jack.



➔ Remove power from the circuit that is to be measured. Open up the circuit and connect the black lead to the negative side and the red lead to the positive side of the circuit so that the test leads are in series with the load to be measured.

➔ Apply power to the circuit.

➔ Read the displayed current.

➔ If the numeral value in the display is too small, change the function switch to next lower range. Repeat until you have maximum digits possible without displaying 'I'.

➔ If 'I' appears on the display, it indicates over-range. Immediately remove test leads from the measuring circuit to avoid any damage to the meter.

b) 200mA or more AC Current Measurement

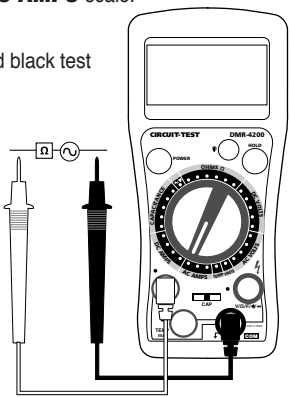
CAUTION! Do not exceed 15 seconds when measuring the 20A range and wait for 30 minutes between each measurement.

➔ Set the function switch to 20 on the **AC AMPS** scale.

➔ The LED above 20A jack will turn on.

➔ Plug the red test lead in 20A jack and black test lead in the **COM** jack.

➔ Remove power from the circuit that is to be measured. Open up the circuit and connect the black lead to the negative side and the red lead to the positive side of the circuit so that the test leads are in series with the load to be measured.



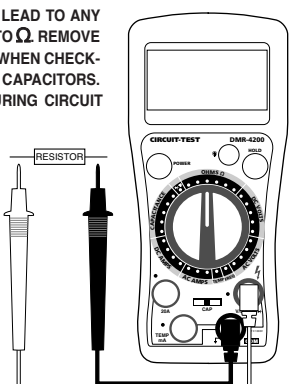
➔ Apply power to the circuit.

➔ Read the displayed current.

➔ If 'I' appears on the display, it indicates over-range. Immediately remove test leads from the measuring circuit to avoid any damage to the meter.

5. RESISTANCE MEASUREMENT

⚠ WARNING: NEVER CONNECT THE TEST LEAD TO ANY VOLTAGE WHEN THE FUNCTION SWITCH IS SET TO Ω. REMOVE ALL POWER FROM THE CIRCUIT BEING TESTED WHEN CHECKING RESISTANCE. DISCHARGE ANY CHARGED CAPACITORS. NEVER APPLY THE TEST LEAD TO THE MEASURING CIRCUIT WHEN CHANGING THE POSITION OF THE FUNCTION SWITCH. IF YOU ARE UNSURE OF THE RESISTANCE BEING MEASURED, SELECT THE HIGHEST RANGE AND REDUCE UNTIL A SATISFACTORY READING IS OBTAINED.



➔ Set the function switch to the desired **OHMS Ω** scale.

➔ The LED next to V/Ω/F/·))/→| jack will turn on.

➔ Plug the red test lead in V/Ω/F/·))/→| jack and black test lead in **COM** jack.

➔ Apply the test leads to the resistor being measured. If the resistor is part of a circuit, it is necessary to disconnect one end of the resistor to avoid any unwanted interference from the rest of the circuit.

➔ Read the displayed resistance.

NOTE:

- *'1' is also displayed when the inputs are not connected.*
- *When measuring resistance above 1MΩ, the meter may take a few seconds to get a stable reading.*
- *Never measure a resistor that has voltage on it.*

6. CONTINUITY TEST

⚠ WARNING: NEVER CONNECT THE TEST LEADS TO ANY VOLTAGE WHEN THE FUNCTION SWITCH IS SET TO ·))/⊣►⊢. REMOVE ALL POWER FROM THE CIRCUIT BEING TESTED WHEN CHECKING RESISTANCE. DISCHARGE ANY CHARGED CAPACITORS.

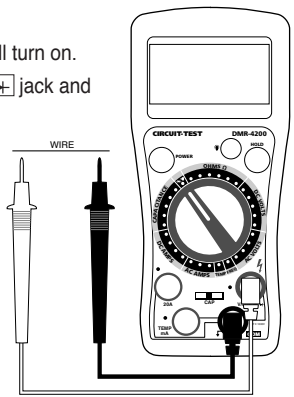
➔ Set the function switch to ·))/⊣►⊢.

➔ The LED next to V/Ω/F/·))/⊣►⊢ jack will turn on.

➔ Plug the red test lead into V/Ω/F/·))/⊣►⊢ jack and the black test lead into **COM** jack.

➔ Apply the test leads to the circuit.

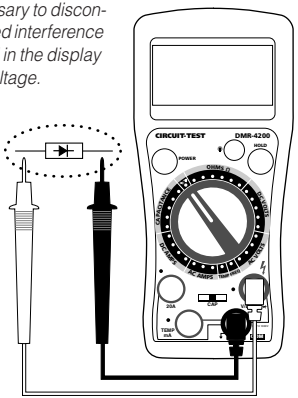
➔ The buzzer will sound if the resistance is less than 30Ω and the measured resistance value will be displayed in ohms.



7. DIODE TEST

⚠ WARNING: NEVER CONNECT THE TEST LEAD TO ANY VOLTAGE WHEN THE FUNCTION SWITCH IS SET TO ·))/→|-. REMOVE ALL POWER FROM THE CIRCUIT BEING TESTED WHEN PERFORMING THE DIODE TEST. DISCHARGE ANY CHARGED CAPACITORS.

Note: If the diode is part of a circuit, it is necessary to disconnect one end of the diode to avoid any unwanted interference from the rest of the circuit. The value indicated in the display during the diode check is the forward bias voltage.

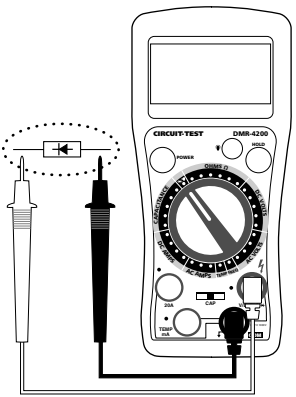


➔ Set the function switch to ·))/→|-.

➔ The LED next to V/Ω/F/·))/→|- jack will turn on.

➔ Plug the red test lead into V/Ω/F/·))/→|- jack and the black test lead into **COM** jack.

➔ Apply the test leads across the diode terminals and note the meter reading.

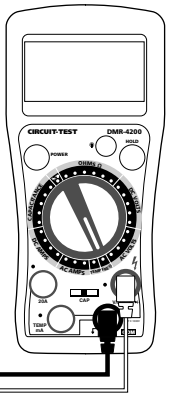


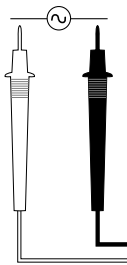
➔ Reverse the diode and note this reading. Based on the reading the result can be evaluated as follows:

- If one reading is around 0.5 and the other reading is 'I', the diode is good
- If both readings are 'I', the diode is open (defective)
- If both readings are very small or 0 (zero), the diode is shorted (defective)

8. FREQUENCY MEASUREMENT

⚠ WARNING: NEVER MEASURE FREQUENCY ON A CIRCUIT WITH MORE THAN 250V.





➔ Set the function switch to **FREQ**.

➔ The LED next to V/Ω/F/·))/⊣◂ jack will turn on.

➔ Plug the red test lead in V/Ω/F/·))/⊣◂ jack and black test lead in **COM** jack.

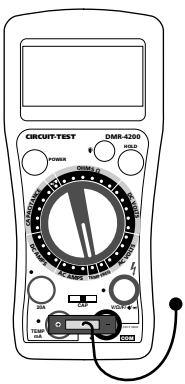
➔ Apply the test leads to the point of measurement.

➔ Read the displayed frequency.

9. TEMPERATURE MEASUREMENT

⚠ WARNING: REMOVE ALL VOLTAGE SOURCES FROM THE CIRCUIT TO BE TESTED BEFORE TAKING A TEMPERATURE MEASUREMENT. DO NOT MEASURE TEMPERATURE OF METAL PARTS WITH A VOLTAGE ON THEM.

NOTE: To measure temperature, 'K' Type Thermocouple (model no. TL-190) and Thermocouple adapter (model no. TL-340) are required.



➔ Set the function switch to **TEMP**.

➔ The LED next to TEMP/mA jack will turn on.

➔ Observing the polarity, plug in the temperature probe adapter with ⊕ inserted in TEMP/mA jack and ⊖ in **COM** jack.

➔ Plug the 'K' type thermocouple in this adapter.

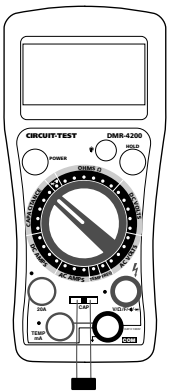
➔ Touch the probe tip to the component you are testing and keep it there for about 30 seconds or until the reading stabilizes.

➔ The digital reading will display the value in proper decimal point & value.

10. CAPACITANCE MEASUREMENT

⚠ WARNING: FULLY DISCHARGE THE CAPACITOR BY SHORTING THE CAPACITOR LEADS TOGETHER BEFORE TESTING.

- ➔ Set the function switch to 20μ on the **CAPACITANCE** scale.
- ➔ Insert the capacitor leads into the **CAP** jack.
- ➔ Read the value and unit shown on the display. If the value does not have enough digits, turn the function switch to a lower range. Repeat until you have the maximum digits possible without displaying 'I'.
- ➔ If 'I' appears on the display, the value of the capacitor is over the maximum range of the meter.



CAPACITOR

11. HOLD FUNCTION

This function is used to hold a reading. When this pushbutton is pressed, the data being displayed at the time will be 'frozen' in the display and **H** will appear in the display. Changes in the input signals will not change the display. This function can be used in all measurement modes. Press the pushbutton again to release this function and **H** will disappear.

12. BATTERY REPLACEMENT

⚠ WARNING: DISCONNECT BOTH TEST LEADS FROM ANY SOURCE OF VOLTAGE BEFORE REMOVING THE BACK COVER. DO NOT OPERATE THE METER UNTIL THE BACK COVER IS IN PLACE AND FASTENED SECURELY.

⊟+ will appear in the display when the battery drops below the operating voltage and requires replacing.

➔ Turn off the meter and disconnect both test leads.

➔ Remove the single screw securing the battery/fuse cover and lift to open.

➔ Replace **9V battery** observing the correct polarity.

➔ Replace the cover and tighten the screw.

13. FUSE REPLACEMENT

⚠ WARNING: DISCONNECT BOTH TEST LEADS FROM ANY SOURCE OF VOLTAGE BEFORE REMOVING THE BACK COVER. DO NOT OPERATE THE METER UNTIL THE BACK COVER IS IN PLACE AND FASTENED SECURELY.

a) 0.5 Amp Fast acting 5x20mm Fuse

➔ Turn off the meter and disconnect both test leads.

➔ Remove the single screw securing the battery/fuse cover and lift to open.

➔ Remove the battery.

➔ Gently pull the fuse from its holder by pulling gently on the ribbon.

➔ Replace the blown fuse with a CSA/UL listed fast acting fuse rated at 0.5A/250V only (with the same ribbon ring around the fuse). Do not use a fuse which has higher rated value than specified or try to bypass the fuse.

➔ Replace the battery and cover and tighten the screw.

b) 15 Amp Fast acting 6.3x32mm Ceramic Fuse (by a professional person only)

➔ Turn off the meter and disconnect both test leads.

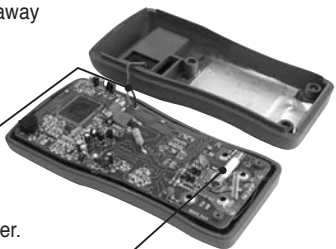
➔ Remove the three screws at the back of the case (one at the top and two at the bottom).

➔ Remove the single screw securing the battery/fuse cover and lift to open.

➔ Remove the batteries.

➔ Carefully lift the top of the case away from the bottom.

CAUTION: Lift the top case carefully - do not break the wires attached to the battery compartment.



➔ Gently lift the battery compartment and move it through the hole on the inner side of the meter.

➔ The 15 amp fuse is the larger fuse on the bottom of the PC board, which should now be in full view. Carefully remove the old fuse and replace it with a new CSA/UL listed fast acting ceramic 15A/250V fuse only.

MAINTENANCE

a) Always keep the meter dry.

b) Keep the meter clean. Wipe the case occasionally with a damp cloth. Do not use chemicals, cleaning solvents or detergents.

c) Use and store the meter in recommended normal environmental conditions. Extreme temperatures can shorten the life of the electronic components.

d) Use only fresh batteries.

e) Remove the batteries when the meter is not being used for a long period of time.

ACCESSORIES

Test Leads (TL-107)
Fuses: 5x20mm Fast Ceramic 0.5A/250V,
6.3x32mm Fast Ceramic 15A/250V
Battery: 1 x 9V

OPTIONAL:
'K' Type Thermocouple (TL-190)
Thermocouple Adapter (TL-340)
Test Leads with Screw-on Alligator Clips (TL-222)

LIMITED WARRANTY

Circuit-Test Electronics warrants to the original purchaser that this product be free of defect in material or workmanship for a period of 2 years from the date of purchase. Visit our website (www.circuittest.com) for information on warranty service.

Any product which has been subjected to misuse or accidental damage is excluded from the warranty. Except as stated above, Circuit-Test Electronics makes no promises or warranties either expressed or implied including warranties of merchantability or the fitness for any particular purpose.

Register your product online at www.circuittest.com